

LABORATORY REARING OF *AMAUROCHROUS CINCTIPES*  
(HEMIPTERA: PENTATOMIDAE: PODOPINAE) WITH  
DESCRIPTIONS OF IMMATURE STAGES

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*Abstract.*—*Amaurochrous cinctipes* (Say) was reared in the laboratory under a 16L:8D photoperiod and constant temperature. Egg and first instar development averaged 6.13 and 4.98 days, respectively. The second through fifth stadia for nymphs reared on *Sagittaria latifolia* Willdenow averaged 15.91, 16.80, 15.33, and 20.00 days, respectively; and on green beans averaged 14.20, 18.67, 15.67, and 17.00 days, respectively. The external anatomy of the egg and each of the 5 nymphal instars is described.

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*Amaurochrous cinctipes* (Say) occurs from Quebec and New England south to the Carolinas, and west and southwest to Minnesota, Nebraska, Kansas, Missouri, Louisiana, and Texas (Barber and Sailer, 1953). It generally seems to occur on vegetation in low marshy places or near bodies of water (McPherson, 1982) and to overwinter beneath cover near water (Blatchley, 1926). It has been collected on *Typha*, *Scirpus*, *Carex*, *Juncus gerardi* Loiseleur-Deslongchamps, and at *Spartina* consociates (McPherson, 1982); nymphs have been found in high numbers on *Typha* (Davis, 1925) and *J. gerardi* (Parshley, 1923). The egg, first, third(?), and fifth instars have been briefly described (Parshley, 1923). This paper presents information on the laboratory rearing of *A. cinctipes* and descriptions of the immature stages.

MATERIALS AND METHODS

*Laboratory rearing.* Between 12 June and 3 July 1981, 23 adults, including copulating pairs, were observed on the leaves and petioles of duck-potato (*Sagittaria latifolia* Willdenow) growing in water near the shore of La Rue Swamp, Union County, Illinois. Ten specimens (3♂♂, 7♀♀) were collected, taken to the laboratory, and placed in an oviposition cage.

The oviposition cage consisted of a round, glass battery jar (ca. 16 cm diam., 20 cm depth) with filter paper covering the bottom. A freshly cut petiole of duck-potato, and attached leaf, served as food and was placed in a water-filled vial stoppered with cotton. A fresh cutting was provided every 3-4 days, and the vial was refilled as needed. The jar was closed with 2 layers of cheesecloth held in place with an elastic band.

The cage was examined daily for eggs. Plant sections, with attached eggs, were removed, placed on moist filter paper in the bottoms of petri dishes (ca. 9 cm diam., 2 cm depth), and covered with the lids. Water was added daily to keep the filter paper moist.

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The first instars (an apparently nonfeeding stage) were also kept in the petri dishes. The second instars were transferred to one of two types of containers and reared to adults. The first type consisted of a lantern globe (ca. 16.8 cm high) set on a clay flower pot (ca. 10.5 cm ID at top) filled with white silica sand and placed in a fingerbowl; water was added as needed to the sand to compact it and provide the insects with better footing. A freshly cut petiole of duck-potato, with attached leaf, served as food and was placed in a water-filled vial stoppered with cotton; the vial was pushed into the sand up to the lip to provide the nymphs easy access to the plant. A fresh cutting was provided every 3–4 days and the vial was refilled as needed. The globe was closed with 2 layers of cheesecloth held in place with an elastic band.

The second type of rearing container consisted of a 1-qt. (ca. 0.95-liter) Mason jar covered on the bottom with filter paper. Green snap beans (*Phaseolus vulgaris* L.) served as food and were placed on end in the bottom of the jar. A strip of paper toweling was added and, together with the filter paper, increased absorption of excrement and provided a good walking surface for the nymphs. The jar was closed with wire screen and paper toweling and secured with the band of the 2-piece mason jar lid. Food, filter paper, and paper toweling were changed every 3–4 days.

The oviposition cage and rearing containers were kept in an incubator maintained at  $23.9 \pm 1.1^\circ\text{C}$  and a 16L:8D photoperiod.

*Descriptions of immature stages.* The description of each stage is based on 10 individuals, unless stated otherwise, that were collected from the laboratory culture and preserved in 95 percent ETOH. The first instar is described in detail, but only major changes from previous instars are described for subsequent instars. Comparative statements refer to previous instars (e.g., "more numerous"). Length is measured from tip of tylus to tip of abdomen; width is measured across the mesonotum. Dimensions are expressed in mm as  $\bar{x} \pm \text{SE}$ . Drawings were made with the aid of a camera lucida, measurements with an ocular micrometer.

#### RESULTS AND DISCUSSION

*Laboratory rearing.* Eggs were deposited in clusters on the petioles and leaves of duck-potato. Each cluster consisted of an alternating double row of 9 or 10 eggs ( $N = 7$ ,  $\bar{x} = 9.71$ ). Each egg was yellowish brown with a brown operculum. A triangular egg burster was readily visible after hatching. The incubation period averaged 6.13 days (Table 1).

The first instars were gregarious and remained atop the egg shells unless disturbed. They apparently did not feed. The duration of this stadium averaged 4.98 days.

The duration of the second through fifth stadia of nymphs reared on duck-potato averaged 15.91, 16.80, 15.33, and 20.00 days, respectively; and on green beans averaged 14.20, 18.67, 15.67, and 17.00 days, respectively. Total developmental time from egg to adult on the 2 plants averaged 79.53 and 76.13 days, respectively.

Heaviest mortality on both duck-potato and green beans (an unnatural host) occurred during the second stadium, the earliest stadium in which nymphs apparently feed. This and the fact that no eggs or nymphs were ever found on duck-potato at La Rue Swamp, and no adults after early July, suggest that this plant is not a natural host.

*Descriptions of immature stages.* EGG (Fig. 1). Length,  $0.93 \pm 0.01$ ; width,  $0.63 \pm 0.01$ . Generally laid in clusters of 10; each egg cylindrically shaped, yellowish brown

Table 1. Duration (in days) of each immature stage of *A. cinctipes*.

Stage	No. completing stadium	Food source	Days		
			Range	$\bar{x} \pm SE$	Cumulative mean age
Egg	37 <sup>a</sup>	—	6-7	6.24 $\pm$ 0.07	6.24
	27 <sup>b</sup>	—	5-7	5.96 $\pm$ 0.16	5.96
	Total	64	5-7	6.13 $\pm$ 0.08	—
Nymph					
1st instar <sup>c</sup>	36	—	5-6	5.25 $\pm$ 0.07	11.49
	27	—	4-5	4.63 $\pm$ 0.09	10.59
	Total	63	4-6	4.98 $\pm$ 0.07	—
2nd instar	11	duck-potato	12-19	15.91 $\pm$ 0.58	27.40
	5	green beans	13-16	14.20 $\pm$ 0.58	24.79
3rd instar	5	duck-potato	14-23	16.80 $\pm$ 1.59	44.20
	3	green beans	16-22	18.67 $\pm$ 1.76	43.46
4th instar	3	duck-potato	15-16	15.33 $\pm$ 0.33	59.53
	3	green beans	13-18	15.67 $\pm$ 1.45	59.13
5th instar	1	duck-potato	—	20.00	79.53
	3	green beans	16-19	17.00 $\pm$ 1.00	76.13

<sup>a</sup> 38 eggs were laid (nymphs subsequently reared on duck-potato).

<sup>b</sup> 30 eggs were laid (nymphs subsequently reared on green beans).

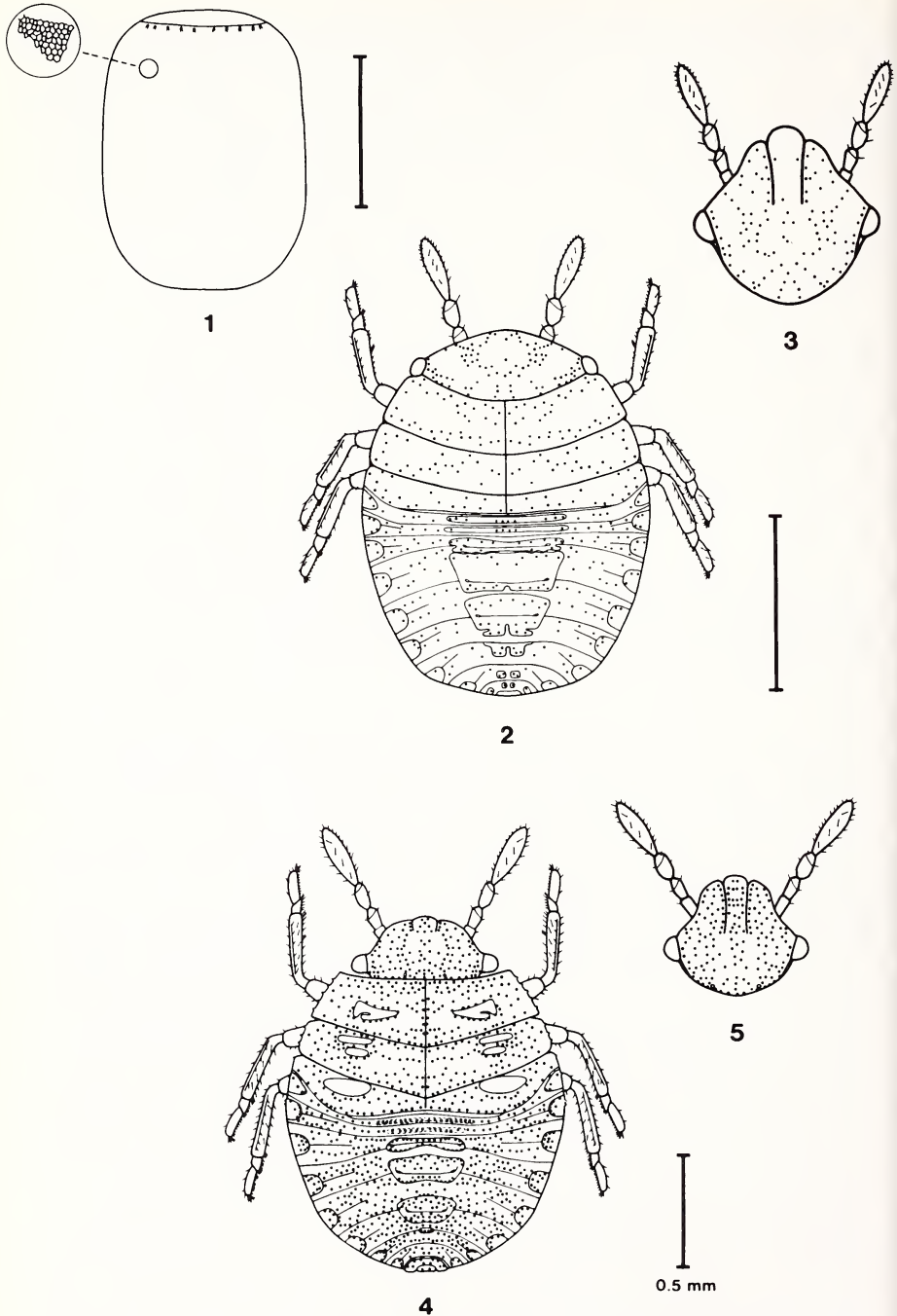
<sup>c</sup> Nonfeeding stage.

with brown operculum at oviposition but fading to yellow after preservation. Chorion with small, irregular pentagonal and hexagonal reticulations. Operculum surrounded by 18-23 micropylar processes, each process ca. 0.03 mm long.

**FIRST INSTAR** (Figs. 2, 3). Length, 1.05  $\pm$  0.02; width, 0.82  $\pm$  0.01. Body elliptical-ovoid, greatest width at abdominal segments 1-2. Large brown punctures present dorsally but not ventrally.

Head declivent, anterolateral margins sinuate; brown dorsally; tylus exceeding juga. Eyes red. Antennae 4-segmented; segments 1-3 brown to light brown; segment 4 largest, fusiform, yellowish brown to brown, apex darker; incisures albidus; distinct constrictions at junctures of 2-3 and 3-4; ratio of antennal segment lengths ca. 21:22:20:57. Ventral surface of head light brown. Beak 4-segmented, whitish to brown.

Thoracic nota brown, mediolongitudinal line extending from anterior margin of pronotum nearly to or reaching posterior margin of metanotum; pro- and mesonota sclerotized, posterior margins moderately arcuate; metanotum sclerotized except posteriorly, posterior margin of plate straight medially, bending cephalad laterally. Pleura concolorous with and reaching nota. Spiracles located on posterior margins of pro- and mesopleura. Sterna concolorous with ventral surface of head and abdomen. Coxae light brown to brown, each with central brown spot on lateral surface; trochanters light brown to brown; femora and tibiae reddish brown to brown, tibiae slightly carinate, dilated distally, front tibiae each with bifurcate spine or inner posterior margin of distal one-third; tarsi 2-segmented, yellowish, apex of segment 2 darker; tarsal claws and pulvilli yellow, translucent.



Figs. 1-5. Immature stages of *A. cinctipes*. 1. Egg. 2, 3. First instar. 4, 5. Second instar.

Dorsum of abdomen whitish to reddish with punctate brown medial and lateral plates. Faint pseudointersegmental lines on all but first and last segments, each originating at inner margin of lateral plate. Eight medial plates present; plates 1–2 linear; plate 3 subrectangular, slightly constricted medially, partially fused to plate 4; plate 4 subtrapezoidal with posteromedial notch, subequal in width and ca. 3–4 times medial length of plate 3; plate 5 subtrapezoidal with posteromedial notch, ca. three-fourths width and ca. 4–5 times medial length of plate 3; plate 6 often with posteromedial notch that almost bisects the plate; plates 7–8 small, paired; paired ostioles of scent glands located on plates 3–5. Nine lateral plates present, subelliptical, extending dorsally and ventrally from margin of abdomen, plates 1–8 (occasionally 9) punctate; plate 1 small; plates 2–5 largest; remainder generally decreasing in size posteriorly. Sterna concolorous with dorsum, segments 4–9 with faint medial plates. Spiracles readily apparent only on segments 2–7. A single trichobothrium located posterior to each spiracle only on segments 4–5.

SECOND INSTAR (Figs. 4, 5). Length,  $1.59 \pm 0.03$ ; width,  $1.14 \pm 0.02$ . Body elliptical, greatest width at metanotum and abdominal segments 1–2. Punctures more numerous dorsally, now present ventrally.

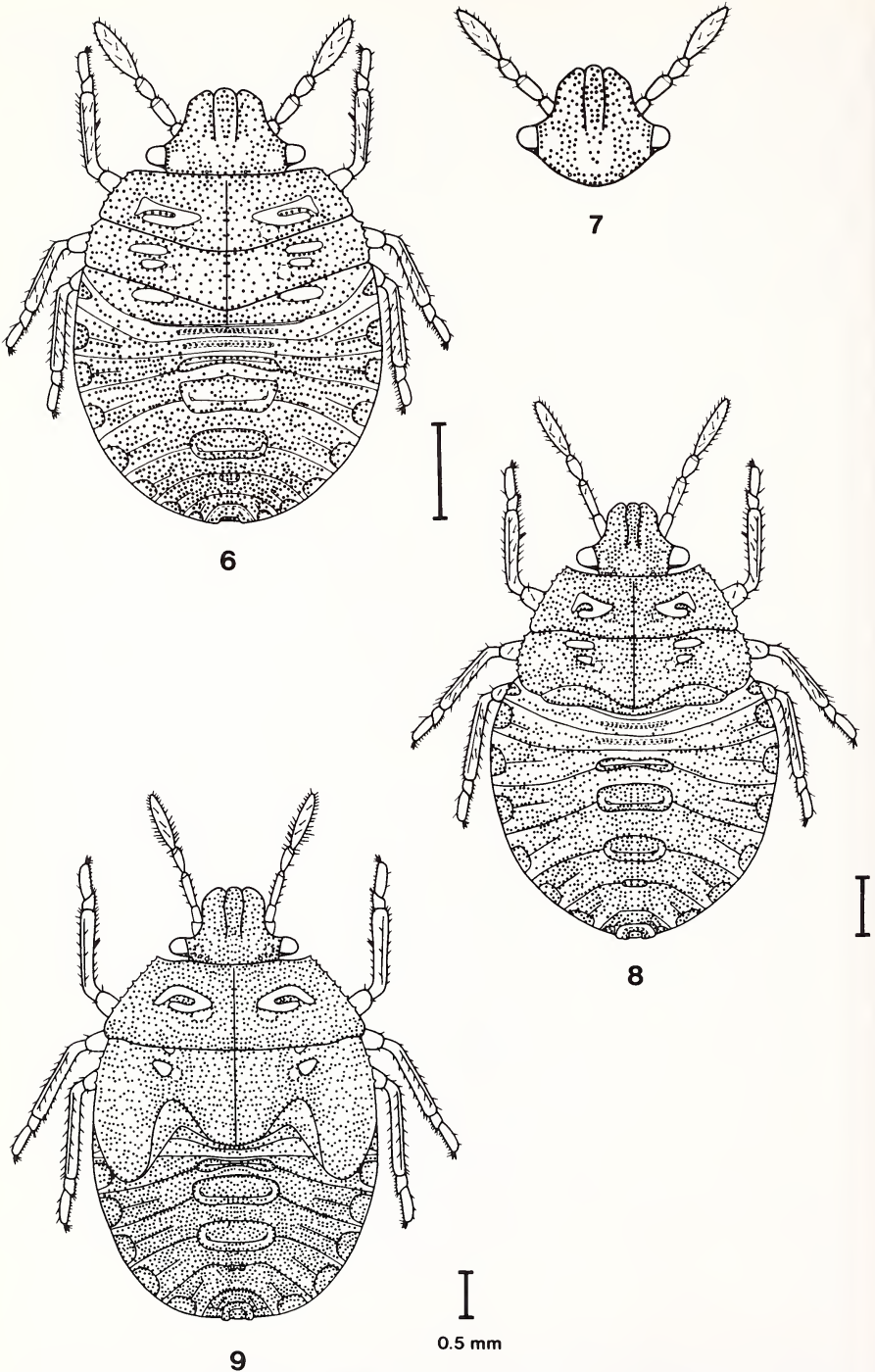
Head less declivent, anterolateral margins more sinuate; yellow to brown dorsally with 2 brown markings near base of tylus that extend and converge ca. one-half way to posterior margin of head, and brown mark adjacent to inner margin of each eye that occasionally extends back to and then medially along posterior margin of head; 2 small red ocelli present posteromedially. Eyes protruding. Antennal segments brown, incisures albidus to red; ratio of antennal segment lengths ca. 10:13:12:29. Ventral surface of head concolorous with dorsum except for white to yellow strip beneath beak and along posterior margin of head. Beak whitish to yellow with apex of last segment darker.

Thoracic nota yellow to brown, lateral margins yellowish, explanate, and dentate; pro- and metanota each with 1 pair, mesonotum with 2 pairs, of brown calli; pro- and mesonota with medial area extended posteriorly. Meso- and metapleura of expanded specimens separated from respective nota by membranous area. Trochanters white to brown; femora and tibiae brown, each lighter at base, tibiae more carinate.

Dorsum of abdomen with medial plates 3–5 and often 8 yellowish brown to brown; lateral plates yellowish. Medial plates 1–2 poorly defined, often appearing as a transverse row of punctures; plate 3 more constricted medially, not fused to plate 4; plates 4–5 subequal in size, slightly wider than, and ca. 4 times medial length of, plate 3, each plate with posteromedial notch greatly reduced; plate 6 small, linear, without posteromedial notch; plate 7 greatly reduced or absent; plate 8 fused to laterals, not paired. Lateral plates slightly crenate along margin of abdomen. Sterna 5–9 (and often 4) with sclerotized subrectangular medial plates, plates impunctate or nearly so; nonsclerotized portions of sterna impunctate medially. Spiracles now apparent on segments 2–8, those of 8 much reduced.

THIRD INSTAR (Figs. 6, 7). Length,  $2.37 \pm 0.06$ ; width,  $1.69 \pm 0.02$ . Body with greatest width at abdominal segments 1–3. Punctures more numerous dorsally and ventrally.

Head less declivent, 2 brown markings near base of tylus converging two-thirds way to posterior margin of head, brown marking along posterior margin of second instar generally absent. Eyes dark reddish brown. Ratio of antennal segment lengths



Figs. 6-9. Immature stages of *A. cinctipes*. 6, 7. Third instar. 8. Fourth instar. 9. Fifth instar.

ca. 7:9:8:19. Ventral surface of head yellowish brown to brown except for white to yellow strip beneath beak and along posterior margin of head, and occasional yellow area on either side of beak that is continuous with yellowish brown stripe between it and base of antenna.

Thoracic nota yellow to brownish yellow; pro- and mesonota often with white to yellow markings posterior to calli. Pleura brown. Sterna white to pink. Coxae pinkish to light brown, each with central brown spot on lateral surface; trochanters white; femora whitish basally, brown distally.

Dorsum of abdomen whitish to yellow, with red markings; medial plate 7 absent; plate 8 yellow. Sterna 4-9 with sclerotized subrectangular medial plates, posterior plates with a few large punctures; nonsclerotized portions of posterior sterna punctate medially. A single trichobothrium located posterior to each spiracle on segments 3-7.

FOURTH INSTAR (Fig. 8). Length, 3.84; width, 2.24; 1 specimen examined. Body with greatest width at abdominal segment 3. Punctures more numerous dorsally and ventrally.

Head less declivent, yellowish brown, 2 brown markings near base of tylus converging near posterior margin of head; tylus and juga subequal in length. Ratio of antennal segment lengths ca. 9:13:11:24. Ventral surface of head brown, markings similar to third instar except that yellow area on either side of beak is larger and yellowish brown stripe between it and base of antenna is now red.

Thoracic nota yellowish brown; lateral margins of metanotum not explanate or dentate; pro- and mesonota with markings posterior to calli now whitish yellow. Meso- and metanotal wing pads ca. same length, extending onto first abdominal segment. Pleura reddish brown. Sterna whitish. Coxae whitish with central brown spot on lateral surface; trochanters whitish.

Dorsum of abdomen whitish yellow with red markings; medial plates 3-5 yellowish brown.

FIFTH INSTAR (Fig. 9). Length, 5.00; width, 3.22; 1 specimen examined. Body with greatest width at abdominal segments 2-3. Punctures more numerous dorsally and ventrally.

Head brownish yellow. Antennal segment 1 yellowish brown; segment 2 yellowish brown with apex red; segment 3 brown; segment 4 black; ratio of antennal segment lengths ca. 12:21:14:34. Ventral surface of head dark brown, markings similar to fourth instar except that red stripe extending from beak to base of antenna is now yellow.

Thoracic nota brownish yellow; pro- and mesonota with markings posterior to calli now white. Meso- and metanotal wing pads ca. same length, extending onto third abdominal segment. Pleura brown, yellowish at bases of coxae. Coxae whitish, central brown spot faint; femora whitish basally, whitish with brownish markings distally; tibiae yellowish brown.

Dorsum of abdomen with medial plates 3-5 yellow with brown margins.

#### ACKNOWLEDGMENTS

We thank Dr. Carl W. Schaefer, University of Connecticut, Storrs, for determining the trichobothrial patterns of the first-third instars. We are also grateful to Karen A. Schmitt, Scientific Photography and Illustration Facility, SIU-C, for the final illustrations of the immature

stages. Costs of these illustrations were met by the Office of Research Development and Administration, SIU-C, and the Department of Zoology.

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Received March 2, 1983; accepted July 27, 1983.